

# What Do We Mean by Human Behavior Representation?

19 Jun 01



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# Overview



- **Application areas**
- **Different classes of models**
  - **Reductionist/Behavior**
  - **First Principle/Information-Processing**
- **A few issues**
- **Mike's knee-jerk reaction to CHRIS**
- **An alternative goal**

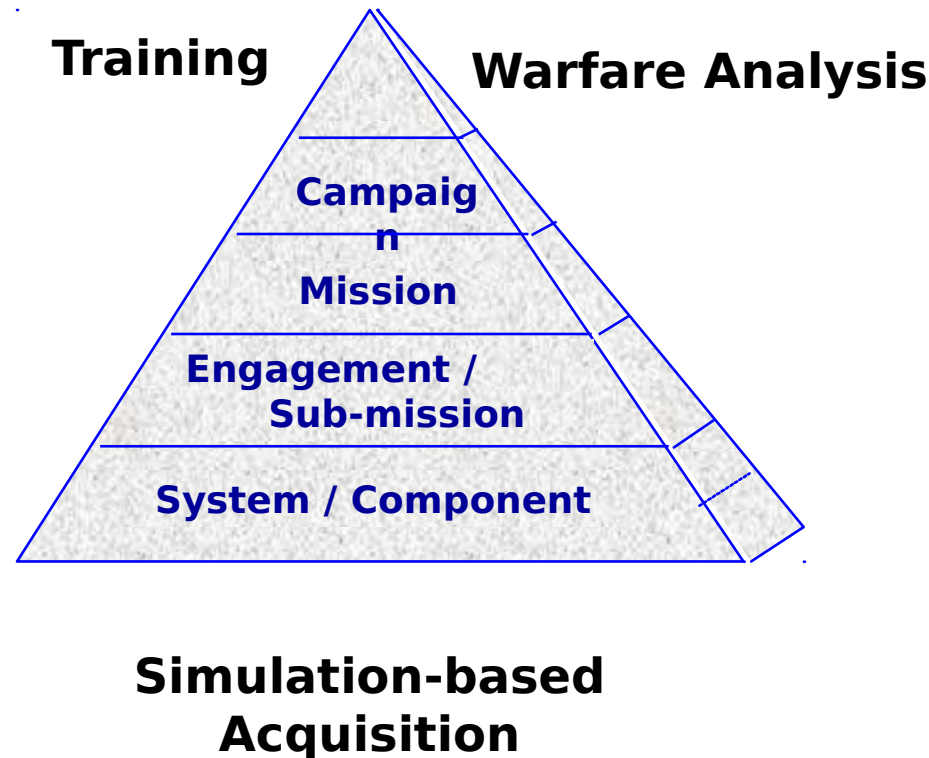


# Application Areas



**Simulation is a vast and diverse enterprise:**

- **Live - real people using real equipment**
- **Virtual - real people using simulated equipment**
- **Constructive - simulated people using simulated equipment**





# Unit Level Training



## **Air Force**

- **Four ship**
- **4 V (4,6,8) maneuvers**
  - **Grinder**
  - **Wall**
- **What is critical in HBR?**
  - **Planning**
  - **Spatial reasoning**
  - **Very fast computation**

## **Army**

- **Tank Platoon**
- **Platoon maneuvers**
  - **Movement to contact**
  - **Hasty defense**
- **What is critical in HBR?**
  - **Planning**
  - **Unit coordination**
  - **Not as fast computation**



# Two Approaches to HBR



## Reductionist/Behavior

- **Behavior**
- **Implementation Architecture**
  - **Simulation environment**
  - **Language primitives**
- **Hardware Implementation (computer)**

## First principle/ Information processing

- **Behavior**
- **Algorithm & Representation**
  - **Information processing**
  - **Cognitive architecture**
- **Integrative Architecture**
  - **Simulation environment**
  - **Language primitives**
- **Hardware Implementation (computer)**



# Reductionist/Behavior (1)



## Finite State Machine

- A list of states
  - A list of command that can be accepted in each state
  - A list of actions for each command
  - A list of required state conditions for each action
- Developed from authoritative sources and doctrine
- Advantages
  - Fast
  - Can be compiled into compact code
- Disadvantages
  - Number of states grows very fast
  - Brittle
  - Only appropriate for relatively simple behaviors



# Reductionist/Behavior (2)



## Task Network

- **Discrete-event simulation environment**
  - **Language**
  - **Development and analysis tools**
  - **Micro models**
- **Describe performance as a series of tasks**
- **Developed from task list and subjective judgment**
- **Advantages**
  - **Easy to use**
  - **Provides good estimate of task time and difficulty**
- **Disadvantages**
  - **Fail to model adaptive behavior**
  - **Limited data/distributions available for complex behavior**



# First Principle/ Information Processing



- **Identify and model the mechanisms that underlie and cause human behavior**
  - **Characterize and parameterize the different stages of information processing (visual processes, working memory, etc.)**
- **Developed (and validated) from scientific research**
- **Advantages**
  - **Excellent models of peripheral processes exist**
  - **Readily available data for most behavior**
  - **Models actually predict human performance**
- **Disadvantages**
  - **Many (central) cognitive processes not well understood**
    - **Meta awareness**
    - **Team skills**
  - **Computationally expensive**





# A Few Issues



- **Modeling behavior versus predicting behavior**
  - Building a model based upon experience
  - Creating a model that (accurately) predicts behavior
- **Force on force versus “mind on mind”**
- **Hard problems:**
  - Teams
  - Organizations
  - Societal groups (mobs, crowds, refugees, clans, etc.)
  - Cultural specificity



# Mike's Knee-Jerk Reaction to CHRIS



- **While a cloud might be a cloud and a road a road, I am not so sure that an HBR is an HBR**
- **The environment is pervasive; behavior is local**
- **Models differ in many ways**
  - **Level of abstraction**
  - **Required data**
- **What is it that we really want to communicate and share?**



# An Alternative Goal



- **There will never be the “best” model; there will always be a best model for a specific application**
- **In developing a model you usually spend significantly more on knowledge acquisition than model creation**
- **The distinction between M&S and real world C2 is blurring**
- **Why not start creating an HBR ontology?**
  - **Might support composablity, aggregation/dis-aggregation**
  - **Might support better interaction with operational systems**